Prediction of asphalt rheological properties using HP-GPC

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Abstract: Asphalt cement is a rheological material because its deformation characteristics vary not only with load but also with rate of load application. The chemical composition of asphalt cement affects its behavior. One of the methods that has been developed to study the molecular structure of materials is high pressure-gel permeation chromatography (HP-GPC). In this paper, the possibility of using the HP-GPC chromatograms to predict asphalt rheological properties is evaluated. Mathematical models are generated to predict the rheological properties of asphalt cement based on its molecular size. In the Gulf countries, there are currently four asphalt-producing refineries that include Ras Tanura and Riyadh refineries in Saudi Arabia, Al-Ahmadi refinery in Kuwait, and Banco refinery in Bahrain. The asphalt produced by those refineries is referred to as 'Arabian asphalt.' For this study to be comprehensive, it was decided to collect asphalt samples from all those refineries. Another set of polymer modified asphalt samples with 5, 10, and 15% crumb rubber and 3, 6, and 9% styrene-butadine-styrene was included in this study to evaluate the effect of polymer modification on the molecular size distribution of the asphalt samples.Asphalt cement is a rheological material because its deformation characteristics vary not only with load but also with rate of load application. The chemical composition of asphalt cement affects its behavior. One of the methods that has been developed to study the molecular structure of materials is high pressure-gel permeation chromatography (HP-GPC). In this paper, the possibility of using the HP-GPC chromatograms to predict asphalt rheological properties is evaluated. Mathematical models are generated to predict the rheological properties of asphalt cement based on its molecular size. In the Gulf countries, there are currently four asphalt-producing refineries that include Ras Tanura and Riyadh refineries in Saudi Arabia, Al-Ahmadi refinery in Kuwait, and Bapco refinery in Bahrain. The asphalt produced by those refineries is referred to as 'Arabian asphalt.' For this study to be comprehensive, it was decided to collect asphalt samples from all those refineries. Another set of polymer modified asphalt samples with 5, 10, and 15% crumb rubber and 3, 6, and 9% styrene-butadiene-styrene was included in this study to evaluate the effect of polymer modification on the molecular size distribution of the asphalt samples.